
Use of Physician Services Following Participation in a Cardiac Screening Program

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Synopsis.....

Cardiac screening programs are ineffective when participants with abnormal findings fail to seek treatment and, to a lesser extent, when participants

with normal findings use medical facilities unnecessarily because of continuing concern about heart disease.

Age, sex, measure of concern about cardiac symptoms and life stress, and abnormal test results were used to predict the use of physician services in the 3 months following screening. Abnormal test results predicted the use of physician services after screening, as did being older, and having life stress and concern about cardiac symptoms. Being older, male, and concerned about cardiac symptoms predicted having at least one abnormal test result. Participants with normal findings and high levels of concern about cardiac symptoms were as likely to see a physician after the screening as were persons with abnormal findings and low levels of concern about cardiac symptoms. Emphasizing participants' concern about symptoms of heart disease or feelings of stress failed to produce an increase in followup for persons who had abnormal screening outcomes.

A MAJOR GOAL OF MASS SCREENING programs is to discover as many new cases of a disease or risk factor as possible at the lowest cost. A secondary, but important, goal should be to ensure followup for (a) confirming abnormal findings, (b) directing to treatment the persons who are screened as needing it, and (c) discouraging the use of medical services by persons for whom the screening outcomes are normal. Typically, however, followup is left to the participant.

Numerous studies have reported low rates of followup for participants who have abnormal findings. For example, 9 to 50 percent of participants who are diagnosed as having high blood pressure fail to seek appropriate followup when the screening is restricted to the diagnosis of risk (1).

Few studies have examined whether mass screening programs discourage inappropriate use of medical services by participants for whom the screening outcomes are normal. To improve the cost effectiveness of screening, as well as its value to the participant, researchers should identify and modify factors that lead to two kinds of error: lack of followup when at risk and unneces-

sary followup when not. Identified in this paper are factors that predict both kinds of error. We report the results of an experiment that attempted to manipulate those factors so that after screening an increase would occur in the use of physician services for participants whose screening outcomes were abnormal.

Four factors were studied that have been found to influence use of medical services: age and sex—older participants (1) and female participants (1, 2) are somewhat more likely to accept referrals after screening; being concerned about symptoms (3), particularly cardiac symptoms; and feeling stressed (4). Having concern about symptoms and feeling stressed are reasons for attending screening, and they are factors that health professionals can address and attempt to modify in interventions designed to increase followup among persons who have abnormal readings. Being concerned about cardiac symptoms or feeling stressed should increase the use of physician services regardless of the screening outcome.

The present study had three aims:

- to identify factors that predict who will have abnormal findings at a cardiac screening,

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Table 1. Rotated factor matrix

Items	Symptom concern	Life stress
Concern about heart.....	.422	.042
Noticed symptoms.....	.569	.049
Noticed fatigue.....	.501	.245
Noticed chest pain.....	.532	.052
Noticed heart pounding.....	.603	.125
Noticed dizziness.....	.638	-.018
Noticed altered vision.....	.542	.033
Work stress.....	.019	.368
Home stress.....	.099	.684
Other stress.....	.072	.351

- to identify factors that predict whether participants will fail to follow up abnormal findings and unnecessarily follow up normal ones,
- to determine whether followup of abnormal findings could be enhanced by acknowledging those factors, such as symptoms of heart disease and feelings of stress, that may have prompted participation in the screening.

Method

The study participants were 280 men and 269 women who attended a University of Wisconsin Hospital cardiac screening program that was open to the public for the first time. The program was widely advertised throughout the community. All participants completed a 27-item questionnaire which is described subsequently. The ages of persons in the sample ranged from 17 to 82 (mean of 49; median, 50). For \$3 participants were given screening tests for systolic and diastolic blood pressure and cholesterol, triglycerides, and glucose levels. Test results were mailed to participants 1 week after screening. A letter mailed 3 months later queried each participant about his or her having visited a physician after the screening. The participants also were asked whether the visit was prompted by the screening, but so many persons,

particularly those with no abnormal findings, failed to answer the question that no further analysis was done of that item.

Of the 275 participants with abnormal findings, the 110 who did not reply to the first letter were sent a second one within 2 months. Of those, 71 answered; 49 had visited a physician. However, we decided against using those data in this analysis because the 71 respondents to the second mailing had an additional 30 to 60 days for visiting a physician than did the respondents to the first letter. The 274 persons with normal findings were sent only 1 letter.

Screening questionnaire. Of the 27 items on the questionnaire, 14 were designed to show reasons for participating in the screening program. (The remaining 13 were about diet and smoking; they were not analyzed for this report.) Participants were asked whether they had noticed or were concerned about cardiac symptoms, such as chest pain or fatigue, had felt unusually stressed at home or work or elsewhere, and had participated because of the low cost and convenience of the screening.

A principal components factor analysis with a varimax rotation was conducted on the items for two random subsamples and the sample as a whole. The solutions emerging from the three analyses were nearly identical and tended to validate our a priori clustering of items. Five factors with eigenvalues greater than 1.0 accounted for 55.3 percent of the total variance in the complete data set. The first factor, "cardiac symptom concern," accounted for 21 percent of the total variance. The reliability (coefficient alpha) of the 7-item scale formed from this factor was .74. The second factor, "being under stress," accounted for 10 percent of the total variance. The reliability (coefficient alpha) of the 3-item scale based on this factor was .42. The respective "symptoms" and "stress" scales were formed by combining items using unit weights (table 1). None of the 3 factors remaining accounted for as much as 10 percent of the variance, so they were not explored further.

Experiment in the notification of screening results. In an attempt to increase followup of abnormal findings, we mailed to participants one of three reports. All participants with normal findings and a randomly selected one-third of those with at least one abnormal finding were sent the standard clinic report. This report listed the values for each screening test. If there were

abnormal findings—these were marked with a red check—a recommendation for followup with the participant's physician was included. A second, randomly selected one-third of participants having abnormal findings received the standard report to which a section had been added. That section consisted of a reminder of the participant's concern about cardiac symptoms and a recommendation to visit his or her physician for followup of that concern and of the abnormal findings. The remainder of participants with abnormal findings were sent the standard report plus a section that had two purposes: it warned that the notice of abnormal findings could exacerbate any feelings of stress the participant might have, and it recommended a followup visit to the physician.

Results

The number of subjects with an abnormal test result was 165 (30 percent) for systolic blood pressure of 140 mmHg; 127 (23 percent) for diastolic blood pressure of 90 mmHg; 63 (11 percent) for cholesterol of 260 mg percent; 99 (18 percent) for triglycerides of 160 mg percent; and 17 (3 percent) for glucose of 120 mg percent. Altogether 274 (50 percent) participants had no abnormal test results, 128 (23 percent) had 1, 105 (19 percent) had 2, 35 (6 percent) had 3, and 7 (1 percent) had 4.

Predictors of screening outcome. The first analysis sought to identify the variables that predict the participant's having at least one abnormal test result. The results of the five screening tests were used to generate a dichotomous variable for screening outcome, all tests normal versus at least one abnormal. Screening outcome was regressed on the four predictors of age, sex, cardiac symptom scale, and life stress scale. Being older, male, and concerned about cardiac symptoms predicted having at least one abnormal test result (all $P < .05$).

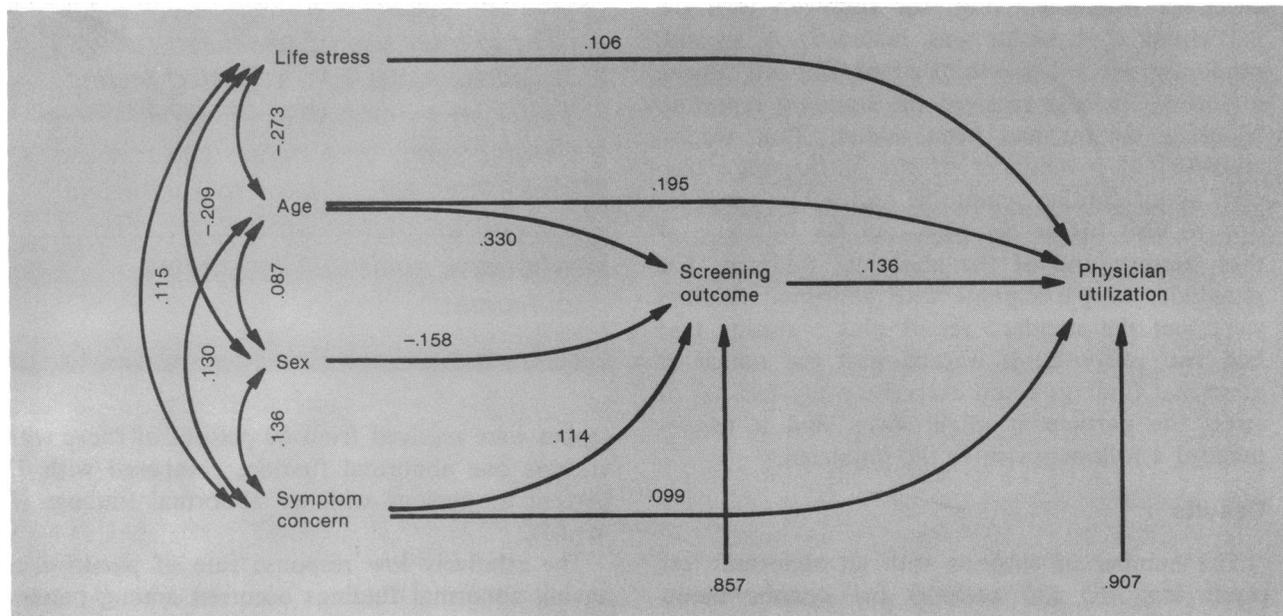
Followup replies. Altogether, 375 of the 549 participants (68.3 percent) replied to the 3-month inquiry about their having visited a physician after the screening. The respondents were similar to the total sample for the factors of age, sex, cardiac symptom concern, and feeling stressed (all $P > .05$). As in the total sample, being older, male, and concerned about cardiac symptoms were significant predictors ($P < .05$) of having at least one abnormal test value. The subsample of respondents differed from the total sample, however, in that

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replies were received from 60 percent of those with at least one abnormal finding, compared with 77 percent of persons with no abnormal findings ($P < .01$).

The relatively low response rate of participants having abnormal findings occurred among participants who received nonstandard reports of their results, that is, the standard clinic report to which a section had been added. There was a significantly greater percentage of replies from participants who received the standard report (70 percent) compared with those who received the cardiac symptom report (59 percent) or the life stress report (50 percent) ($P < .05$). A comparison of the three groups, however, showed no significant difference in the proportion of respondents who reported having made a followup visit to the physician ($P > .25$). The three groups of participants with abnormal results did not differ significantly on the independent variables of age, sex, concern about symptoms, and life stress (all $P > .05$). Using a technique for comparing three correlations at a time (5), we found that the correlations did not differ significantly for the following pairs of variables across the three groups: age and use of physician services, sex and use of physician services, concern about symptoms and use of physician services, or life stress and use of physician services (all $P > .05$). The subsequent data analysis thus combines results from all three groups.

Predictors of followup. Of the 375 respondents, 174 (46 percent) reported having seen a physician during the 3 months after screening. Use of physician services (not going to the physician versus going) was regressed on five predictors—screening outcome (all normal versus at least one abnormal test result), age, sex, cardiac symptom concern scale, and life stress scale. Respondents



were more likely to see a physician if they had an abnormal test result, were older, and were feeling stressed (all $P < .05$). They were somewhat more likely to see a physician if concerned about cardiac symptoms ($P = .08$). Seventy-eight of the 210 participants with normal results (37 percent) and 96 of the 165 participants with abnormal results (58 percent) reported visiting a physician.

The results of the two regression analyses for the 375 respondents can be represented by the path diagram in the chart. The nonsignificant paths have been deleted from the figure (for example, from life stress to screening outcome and from sex to physician utilization) and the regression coefficients for the other paths recalculated. All paths, including the direct path from the cardiac symptom scale to use of physician services, are now significant at the $P = .05$ level. The fit between the entire model in the figure and the data was tested using linear structural equations (6). The model is not inconsistent with the data ($\chi^2 = 1.169$, $df = 2$, $P > .5$), though other models may also fit. The model suggests that age, feeling under stress, and having concern about cardiac symptoms predict, after removing the contribution of screening outcome, the use of physician services. Table 2 shows the Pearson correlations between the variables.

Discussion

The model in the chart indicates that visiting a physician after screening is not simply a function

of the test results, but also of being older and concerned about cardiac-related symptoms and of feeling under stress at the time of screening. The use of physician services in the next 3 months was the same (44 percent) for participants with normal test results scoring in the upper half of the cardiac symptom scale as for participants with abnormal results in the lower quartile on the scale.

These results suggest that screening programs must do more than just detect disease; they also should educate and motivate participants to use health resources wisely. Attention should be directed to improving followup for participants with high blood pressure. The results also suggest that many participants were not reassured by their normal test results and may have sought medical care unnecessarily. Screening programs should reassure participants who have normal test results and provide them with information about an appropriate followup response. In a recent unpublished study, we (Zimmerman, Safer, Leventhal, and Baumann) compared the post-screening use of physician services by normotensive participants who had received, at the screening, standard printed material about blood pressure with participants who were explicitly told that they need not have their blood pressure checked for 1 year. After 9 months, the latter group was significantly less likely to report having had their blood pressure checked since the initial screening. They were also more apt to answer correctly that 1 year was the proper interval between screenings for persons who have normal blood pressure.

Table 2. Pearson correlates between predictors of physician utilization for 375 respondents

Description of variables	Measurement	Life stress	Age	Sex	Concern about symptoms	Screening outcome	Physician utilization
<i>Independent variables</i>							
Life stress	scale 0-8	1.0					
Age	from 17 to 82 years	³ -.273	1.0				
Sex	0 = male; 1 = female	³ -.209	.087	1.0			
Concern about symptoms	scale 0-16	¹ .115	¹ .130	² .136	1.0		
Screening outcome	0 = no abnormal findings 1 = at least 1 abnormal finding	-.050	³ .331	¹ -.114	² .135	1.0	
<i>Dependent variable</i>							
Physician utilization	1 = no; 2 = yes	.057	³ .224	.043	² .155	³ .209	1.0

¹ P < 0.05. ² P < 0.01. ³ P < 0.001.

The greater use of physician services by participants who reported feeling under stress or being concerned about cardiac symptoms suggests that these conditions can be used to encourage appropriate followup by participants who have abnormal screening outcomes. This study attempted to test this suggestion by randomly designating participants who have abnormal findings to receive one of three different reports of their test results. This attempt was not successful and, indeed, participants who received reports reminding them of their cardiac-related concern or their life stress were less likely to return the postcard querying them about their having visited a physician.

It is possible that a bias was introduced into the data because of the reduced rate of return of postcards from participants who had received the letter reminding them of cardiac-related concern and life stress. However, any such bias would have no effect on data from the participants with normal findings. There were no differences for participants with abnormal findings who were sent the three letters; that is, the data showed neither significant mean differences on key dependent measures nor significant differences for correlations between variables when they were compared across the three groups. It is unlikely, therefore, that self-selection biases affect our conclusion that symptom concern and life stress influenced followup for persons who had abnormal test results, or that many persons with normal test results unnecessarily sought medical services after the screening.

The contrast between the positive association of being concerned to followup behavior and the reduced rate of return of our postcard questionnaire by participants who received reminders of

their concerns along with their screening results makes another critical point. Even when correlational findings reflect causal relationships, translating those findings into acceptable and useful interventions is complex and full of surprises. Further theoretical analyses and experimental tests are needed to generate and evaluate communications designed to alter behavior based on concern about symptoms and perceived life stress.

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